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(54) **A multi-layered chewing gum composition and a process for the production thereof.**

(57) There is disclosed a chewing gum composition which comprises a first region, a second region and, optionally, one or more further regions, each region having a different composition, wherein each region is capable of releasing a flavour at a different rate, wherein the first region comprises from 14 % to 18 % by weight of a gum base and a flavouring agent, and wherein the second region comprises at least 22 % by weight of a gum base and a flavouring agent, the percentages being based on the weight of the respective regions of the chewing gum composition.

The chewing gums have enhanced flavour impact and quick and sustained flavour release characteristics.

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A MULTI-LAYERED CHEWING GUM COMPOSITION AND A PROCESS FOR
THE PRODUCTION THEREOF

This invention relates to a chewing gum of the two layer laminate type of which one layer has a high initial flavor release layer and the other layer has a longer lasting flavor release.

Chewing gum research has concentrated on the development of products that have a good taste and chew. This has been accomplished by adjusting gum base, flavor, sweetener content and flavor release characteristic. However, there has been difficulty in achieving easy bite, flavor impact, quick flavor release and sustained flavor in a single chewing gum composition.

U.S. Patent No. 4,352,824 discloses a chewing gum composition having long lasting flavor. The desired result is accomplished by incorporating into the chewing gum a non-aqueous solid fatty or gelatinous material, e.g. butter. In order to provide initial flavor, a separate pre-sweetened or pre-flavored slab of conventional chewing gum is combined with the slab of gum containing the fatty or gelatinous material.

U.S. Patent No. 4,352,823 discloses a coextruded gum having a soft core portion comprising a polyisobutylene elastomer and at least about 5% up to about 10% moisture surrounded by a harder shell of conventional gum composition. This patent relies on the combination of plasticizers (glyceryl triacetate and acetylated monoglyceride) to provide softness to the gum base.

Similarly, U.S. Patent No. 4,352,825 discloses a coextruded gum having a soft center of high water content and containing a combination of at least two recrystallized sweeteners. No specific characteristic other than the physical characteristics of easy bite

and easy chew are attributed to the soft gums of the prior art. The purpose is to provide a way for handling soft gum compositions in conventional wrapping machines. The soft gum composition is said to have an
5 easy bite and chew.

It has surprisingly been found that flavor impact, quick flavor release and easy bite as well as sustained flavor release can be achieved in a chewing gum by preparing a first chewing gum composition comprising a low
10 gum base content and a second chewing gum composition having a high base content, and combining the two compositions in a non-homogenous manner, e.g. chewing gum comprising multiple layers. The low base content
15 composition contains liquid flavor and sweetener and, optionally, spray dried flavors. Thus, rather than rely on additional additives such as plasticizers and softeners to impart softness to the chewing gum composition, as was common in the art, the instant
20 invention uses a critical range of gum base in each of the layers comprising the chewing gum composition as a whole.

Different flavor release rates are obtained in the layers by having a first chewing gum composition with a
25 gum base content of about 14% to 18% by weight and a second chewing gum composition with a gum base content of at least 22% by weight, and a differential in gum base content between the first and second composition of about 4% to about 12%.

30 The gum layers are laminated together by a conventional method, e.g. coextrusion, roller pressing, etc.

This invention relates to a chewing gum comprising
35 at least two different chewing gum compositions. In particular it relates to a two-layer chewing gum

composition having a first layer exhibiting quick initial release of flavor and flavor impact and a second layer having sustained release of flavor. The quick initial flavor release is accomplished by using a low gum base content in the first layer. The advantages of the instant invention are obtained by using materials common to the art. Except for the differential in gum base content of the different layers, the amounts of various conventional additives and the moisture level of the final chewing gum products are those well known to the art. Optionally, however, the amount of flavor can also be varied from layer to layer in the chewing gum composition.

The method of this invention results in a chewing gum laminate composite which has a differential release rate of flavor in each of the two layers. This differential release rate aspect of the invention may be utilized in the controlled release of other chewing gum adjunctives such as medicaments.

In the practice of this invention, the constituents of each of the chewing gum composition layers are those chewing gum constituents well known in the art.

Chewing gum compositions generally are comprised of a gum base, a sweetener, and a softener. Other agents such as bulking agents, thickeners, fillers and flavoring agents are also commonly used in the art.

As is well known in the art, the gum base comprises natural or synthetic gums or elastomers. The elastomers, of course, are not vulcanized. Illustrative nonlimiting examples of gums and elastomers useful as gum bases are natural rubber, chicle, lechicapi, jelutone, polyisobutylene, isobutylene-isoprene copolymers and styrene-butadiene copolymers. Mixtures of these gums and elastomers is also contemplated. The gum base generally comprises about 20% by weight to

about 30% by weight based on the total chewing gum composition. The gum base may contain elastomer solvents to aid in softening the gum or elastomer component. Illustrative, non-limiting examples of such elastomer solvents are the methyl, glycerol or pentaerythritol esters of rosins or modified rosins, such as hydrogenated, dimerized or polymerized rosins or mixtures thereof. Examples of the rosins useful in the preparation of gum bases include the pentaerythritol ester of partially hydrogenated wood rosin, pentaerythritol ester of wood rosin, glycerol ester of partially dimerized rosin, glycerol ester of polymerized wood rosin, glycerol ester of tall oil rosin, glycerol ester of wood rosin and partially hydrogenated wood rosin, as well as partially hydrogenated methyl ester of rosin such as polymers of α -pinene or β -pinene; terpene resins including polyterpene and mixtures thereof. The elastomer solvent can be employed in an amount ranging from about 10% to about 75% by weight of the gum base, preferably about 45% to about 70% by weight.

It is generally well known that corn syrup serves several purposes in chewing gum composition. One such purpose is as a source of moisture. Another purpose is as a bulking aid. Still another purpose is as a sweetener. Corn syrup is generally utilized at about 15% to about 20% by weight. The specific amount of corn syrup will depend on the overall formulation of the gum composition and should be controlled to provide a moisture content of about 3% to about 6% as is customary in the art.

The chewing gum compositions of this invention will generally include a sweetening agent. The sweetening agent may be selected from a wide range of materials including water-soluble agents, water-soluble artificial

sweeteners, and dipeptide based sweeteners, including mixtures thereof. Without being limited to particular sweeteners, representative illustrations encompass:

A. Water-soluble sweetening agents such as
5 monosaccharides, disaccharides and polysaccharides such as xylose, ribose, glucose, mannose, galactose, fructose, dextrose, sucrose, sugar, maltose, partially hydrolyzed starch, or corn syrup solids and sugar alcohols such as sorbitol, xylitol, mannitol and mixtures thereof.

10 B. Water-soluble artificial sweeteners such as the soluble saccharin salts, i.e., sodium or calcium saccharin salts, cyclamate salts, acesulfam-K and the like, and the free acid form of saccharin.

C. Dipeptide based sweeteners such as
15 L-aspartyl-L-phenylalanine methyl ester and materials described in U.S. Patent No. 3,492,131 and the like.

In general, the amount of sweetener will vary with the desired amount of sweeteners selected for a particular chewing gum. This amount will normally be 0.001%
20 to about 90% by weight when using an easily extractable sweetener. The water-soluble sweeteners described in category A above, are preferably used in amounts of about 25% to about 75% by weight, and most preferably from about 50% to about 65% by weight of the final
25 chewing gum composition. In contrast, the artificial sweeteners described in categories B and C are used in amounts of about 0.005% to about 5.0% and most preferably about 0.05% to about 2.5% by weight of the final chewing gum composition. These amounts are ordinarily
30 necessary to achieve a desired level of sweetness independent from the flavor level achieved from flavor oils. While water may be added, independently, with dry sweeteners, it will generally be added as part of a corn syrup or corn syrup mixture.

In order that the chewing gum composition have an acceptable texture it is preferred that a softening agent be included in the composition. Softening agents as used herein refers to emulsifiers, plasticizers, softeners and the like. Illustrative, nonlimiting examples of suitable emulsifiers include lecithin, fatty acid and monoglycerides, di- and triglycerides, propylene glycol monostearate, glycerol monostearate and mixtures thereof. Such materials may be used in amounts of about 1% to about 25% by weight.

A variety of different ingredients such as plasticizers or softeners including lecithin, stearic acid, sodium stearate, potassium stearate, glyceryl triacetate, glycerine and the like as well as natural waxes, petroleum waxes, such as polyethylene waxes, paraffin waxes and microcrystalline waxes may also be incorporated into the gum base to obtain a variety of desirable textures and consistency properties. These materials are generally employed in amounts of up to 30% by weight and preferably in amounts of about 1% to about 25% by weight, more preferably about 3% to about 10% by weight of the chewing gum composition.

The chewing gum composition of this invention may additionally include the conventional additives of coloring agents such as titanium dioxide; and fillers such as aluminum hydroxide, alumina, aluminum silicates, talc, dicalcium phosphate, calcium carbonate, and combinations thereof. Preferably the amount of fillers are about up to 25% by weight of the gum base.

Flavoring agents well known to the chewing gum art may be added to the chewing gum compositions of the instant invention. These flavoring agents may be chosen from synthetic flavor oils and flavoring aromatics, and/or oils, oleo resins and natural extracts derived from plants, leaves, flowers, fruits and so forth, and

combinations thereof. These flavoring agents are generally liquids. However, they can also be used as spray dried solids. These spray dried solids can be prepared by dissolving or dispersing the flavoring agent in a water solution of maltodextrin and spray dried. The flavoring agent is adsorbed into the maltodextrin. The use of flavoring agents having other distinct physical forms such as powdered flavorings, beaded flavorings and encapsulated flavorings are within the scope of this invention. Illustrative non-limiting examples of flavoring oils include spearmint oil, cinnamon oil, oil of wintergreen (methylsalicylate) and peppermint oils. Synthetic and natural fruit flavors are also useful as flavoring agents including such flavorings as citrus oil, e.g., lemon, orange, lime and grapefruit; fruit essences including apple, strawberry, cherry, pineapple and banana; and various flavorings such as aldehydes and esters including cinnamyl acetate, cinnamaldehyde, citral diethyl acetal, dihydrocavryl acetate, eugenyl formate p-methylamisol, etc. Generally any flavoring or food additives such as those described in Chemicals Used In Food Processing, pub 1274 by the National Academy of Sciences, pages 49-53 and 63-258 may be used.

The term "flavoring agent" as used in the specification and claims means any of the natural and synthetic flavorings or combinations thereof used in the chewing gum art and in particular those flavoring agents heretofore described.

The amount of flavoring agent employed is normally a matter of preference and will be determined by such factors as flavor type, gum base type and the strength desired. In general, amounts of about 0.05% to about 3.0% by weight of the overall chewing gum composition

are used, preferably about 0.3% to about 1.5%, more preferably about 0.7% to about 1.2% by weight.

As used in the specification and claims, the term "chewing gum composition" is used in its commonly
5 accepted meaning in the art, i.e. a composition comprising a gum base, softeners, bulking agents, emulsifiers, softeners, fillers, flavoring agents and other adjunctives known to the chewing gum art. The
10 chewing gum compositions of the instant invention generally have a moisture content of at least 2% by weight of the compositions to about 8%, preferably about 3% to about 6% by weight

As previously discussed, the chewing gum products of the instant invention comprise multi-layers of
15 substantially the same or different chewing gum compositions. More particularly, at least two discrete layers are present, although numerous layers are contemplated to accommodate a variety of desired properties such as staggering the release of different
20 flavors, varying the chew properties, etc.

At least two layers of the multi-layered gum composition must have different flavor release rates. One layer must be formulated to provide a rapid initial flavor release, e.g., a burst of flavor; while another
25 layer is formulated to provide a longer, sustaining flavor release. It is this combination of different flavor release properties due to the critical gum base amounts which gives the layered chewing gum composition and products made therefrom their advantage over prior
30 art chewing gum compositions.

To obtain different flavor release rate, the layers are formulated from different percentages of gum base. This is critical to the invention. Those layers which are to provide rapid initial flavor release
35 have a gum base content of about 14% to about 18% and preferably about 15% to about 17% by weight of the respective layer of the chewing gum composition.

Those layers which have a sustaining flavor release generally contain gum base in the amount of about 22% to about 30% by weight of the respective layer of the gum composition. The differential between the gum base content of one layer and the next layer is at least about 4% to about 12% and preferably about 7% to about 10%; and more preferably about 8%, by weight.

Those layers with less gum base and rapid flavor release would be expected to have softer chew properties and likewise those with a high gum base content and longer flavor release properties would be expected to have a harder chew.

Although two layers having differential flavor release properties is the preferred embodiment of the instant multi-layered chewing gum compositions, a multitude of layers, each having different flavor release capabilities is within the intended scope of this invention. Except for flavor concentration and gum base concentration, the composition of the individual layers may be substantially the same.

In preparing the chewing gum composition of each of the layers, the same processing techniques well known in the art can be used. Generally, the gum base, corn syrup and lecithin are blended together for about two minutes at a temperature of about 82° to about 94°C. The remaining constituents are then added and heating is continued for about five minutes longer. The chewing gum composition is then formed into sheets or ropes and conditioned for about 24 hours at room temperature. The conditioning of the gum is primarily a partial drying and moisture equilibration step.

The chewing gum composition layers are laminated to one another in any of the techniques known in the art. For example, upon cooling the chewing gum compositions, they can be coextruded by known techniques to form a two-layer laminate. Alternatively, the two layers may be independently formed and then stacked, one upon the other, and passed through nip rolls.

Since the low gum base content layer has a quick flavor release, it will generally contain a lesser amount of flavoring agent than the high base content slower flavor release layer. However, it is within the scope of this invention to have both layers contain the same amount of flavoring or either of them may have more flavoring than the other. Similarly, different compatible flavors may be selected for inclusion in each of the different layers. For example, the first layer may contain banana; the second layer strawberry. Other flavor combinations include orange/pineapple, lemon/ lime, etc.

The advantages of this invention may be more readily appreciated by reference to the following examples.

EXAMPLE I

A two layer gum was prepared using banana as the flavor in the softer low gum base layer and strawberry as the flavor in the harder high gum base layer. The strawberry flavor was utilized at a higher concentration than the banana flavor. The formulation is shown in Table I.

Table I

		Percent by Weight	
Component		First Soft Layer	Second Layer
25	Gum Base	16.0	24.0
	Corn Syrup	17.0	17.0
	Maltodextrin(1)	0.75	0.75
	Liquid Flavor	0.5(banana)	1.25(strawberry)
	Powdered Flavor	0.75(banana)	0.75(strawberry)
30	Glycerine	0.4	0.4
	Lecithin	0.2	0.2
	Color	0.1 (yellow)	0.1 (red)
	Sugars	64.25	55.50
		100.00	100.00

- (1) modified maltodextrin ca. 3-6 lbs./cu.ft.
 (2) glycerin and lecithin

After conditioning the two layers, they were pressed together and cut into strips. The gum had an initial intense banana flavor followed by a commingling of flavors. After chewing for about 2 to 4 minutes the gum had a distinct, sustained strawberry flavor.

EXAMPLE II

A two layer orange-pineapple flavored gum was prepared using the compositions shown in Table II.

Table II

		<u>Percent by Weight</u>	
<u>Component</u>		<u>First Layer</u>	<u>Second Layer</u>
	Gum Base	17.0	25.0
5	Malic Acid	0.5	-
	Corn Syrup	17.0	17.0
	Liquid Flavor	1.0 (orange)	1.0 (pineapple)
	Powdered Flavor	0.5 (orange)	-
	Citric Acid	0.25	-
	Color	0.2 (orange)	0.2 (yellow)
	Lecithin	0.2	0.2
10	Glycerin	0.4	0.4
	Sugars	<u>63.0</u>	<u>56.05</u>
		100.00	100.00

Sheets of each flavor were pressed together to form a two-layer laminated chewing gum. Upon mastication, the chewing gum had an orange flavor followed by an orange/pineapple mixture and subsequently a sustained pineapple taste.

EXAMPLE III

A lemon-lime two-layer gum was prepared in accordance with the practice of this invention using the formulation set forth in Table III.

Table III

		<u>Percent by Weight</u>	
<u>Component</u>		<u>First Soft Layer</u>	<u>Second Layer</u>
	Gum Base	17.0	23.0
5	Malic Acid	0.5	0.5
	Corn Syrup	17.0	17.0
	Citric Acid	0.25	0.25
	Flavor	1.0 (lemon)	1.0 (lime)
	Lecithin	0.2	0.2
10	Glycerin	0.4	0.4
	Color	0.1	0.1
	Sugar	<u>63.5</u>	<u>57.5</u>
		100.00	100.00

15 The two layered gum prepared with these compositions had excellent taste characteristics and exhibited a noticeable flavor release differential upon mastication as described in previous examples.

20 It is also within the scope of this invention to prepare mixtures of the low gum base content and high gum base content chewing gum compositions of this invention under conditions that do not cause homogenization of the two compositions. This can be accomplished by mixing the two compositions at room temperature. For example, ropes of a low gum base content composition can be braided with ropes of a high gum base content composition and rolled into sheets. In another embodiment two or more compositions of different gum base content are coextruded into sheets in a low shear extruder to avoid homogenization.

While low gum base compositions are known to have easy bite, they are not readily handled on conventional packaging equipment. By using the combination of compositions as herein disclosed the overall chewing gum composition retains the easy bite of the low base composition and is readily handled on conventional packaging equipment.

It is within the scope of this invention to include medicaments in the low base content chewing gum composition of this invention. The medicaments or other active agents included in the composition are quickly and substantially entirely released from the gum composition upon chewing. The term active agent as used in the specification and claims means any drug, medicament or other substance taken for its medicinal or dietary properties.

Illustrative, non-limiting examples of active agents which can be incorporated in the low gum base chewing gum composition of this invention include benzocaine, phenolphthaline, laxatives, lobeline sulfate (no smoking aid), calcium carbonate and magnesium carbonate as antacids, aspirin, fluorides for tooth decay prevention, nicotine as a smoking substitute, vitamins, minerals, caffeine, citrated caffeine, caffeine sodium benzoate, caffeine hydrochloride, appetite suppressants, and the like.

The active agent comprises about 1 to about 10% by weight of the low base content chewing gum composition, preferably about 1 to about 5% by weight, more preferably about 2% to about 4%, e.g. 3%. For example, vitamin C is included in the chewing gum composition at about 60 mg per stick, i.e. about 2.7% by weight. Appetite suppressing gums can include about 5 mg of benzocaine per stick.

Illustrative active agent containing low gum base content chewing gum composition are illustrated in Table IV.

Table IV
Active Agent Containing Gum

		Weight Percent			
<u>Component</u>		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
5	Gum base	17.0	17.0	17.0	25.0
	Corn Syrup	17.0	17.0	17.0	17.0
	Citric Acid	0.25	0.25	0.25	0.25
	Malic Acid	0.5	0.5	0.5	0.5
	Flavor	1.5(1)	2.0(3)	2.0(5)	2.0(5)
10	Lecithin	0.2	0.2	0.2	0.2
	Glycerin	0.4	0.4	0.4	0.4
	Color	0.2(2)	0.1(4)	0.1(6)	0.1(6)
	Sugar	60.24	62.45	62.50	54.5
	Coated Ascorbic				
15	Acid	1.353	-	-	-
	Sodium Ascorbate	1.333	-	-	-
	Chlorophyll	-	0.05	-	-
	Benzocaine	-	-	0.225	-
		100.0	100.0	100.0	100.0
20	(1) 1.0% liquid orange flavor and 0.5% powdered orange flavor				
	(2) orange;				
	(3) lime;				
	(4) green;				
25	(5) lemon;				
	(6) yellow.				

Sheets of formulations A, B and C were pressed together with the high gum base content formulation D to form a two layer gum.

While this invention has been described in terms of preparing two separate chewing gum compositions, it is within the scope of this invention to prepare a single chewing gum composition having a chewing gum content of at least 22% by weight, dividing the composition into two ketches and adding a diluent to one ketch to reduce its base content to about 14% to about 18% by weight. Suitable diluents include xylitol, mannitol and sorbitol.

CLAIMS:

1. A chewing gum composition which comprises a first region, a second region and, optionally, one or more further region, each region having a different composition, wherein each region is capable of releasing a flavour at a different rate, wherein the first region comprises from 14% to 18% by weight of a gum base and a flavouring agent, and wherein the second region comprises at least 22% by weight of a gum base and a flavouring agent, the percentages being based on the weight of the respective regions of the chewing gum composition.
2. A composition according to Claim 1, wherein the weight percent of gum base in the first region is from 15% to 17% and the weight percent of gum base in the second layer is about 24%, based on the weight of the respective regions of the chewing gum composition.
3. A composition according to Claim 1, wherein the weight percent of the gum base in the second region is about 25%, based on the weight of the second region of the chewing gum composition.
4. A composition according to Claim 1, 2 or 3, wherein the differential, in terms of percentage points by weight, of the gum base between the first and second regions is from 4% to 12%, preferably from 6% to 10%.
5. A composition according to any preceding claim, wherein the gum base comprises a natural rubber, a synthetic rubber, or a mixture thereof.
6. A composition according to Claim 5, wherein the rubber is chosen from: chicle, jelutong, baluta, gutta-percha, lechi caspi, sorva, butadiene-styrene copolymers, polyisobutylene, isobutylene-isoprene copolymers and mixtures

thereof.

7. A composition according to any preceding claim, wherein each region further comprises a sweetening agent.

5 8. A composition according to Claim 7, wherein the sweetening agent is chosen from: water-soluble sweetening agents, water-soluble artificial sweeteners, dipeptide based sweeteners and mixtures thereof.

10 9. A composition according to any preceding claim, wherein one or more of the regions further comprises: plasticizers, fillers, rubber softeners, emulsifiers, colouring agents, bulking agents and mixtures thereof.

15 10. A composition according to any preceding claim, wherein the flavouring agent, which may be the same, or different, for each region, is chosen from: spearmint oil, peppermint oil, cinnamon oil, oil of wintergreen (methylsalicylate), lemon
20 oil, orange oil, grape flavour, lime oil, grapefruit oil, banana flavour, apple essence, strawberry essence, cherry essence, pineapple essence, cinnamyl acetate, cinnamaldehyde, citrol diethyl acetal, dihydrocavryl acetate, eugenyl formate,
25 p-methylamisol, and combinations thereof.

11. A composition according to any preceding claim, wherein the flavouring agent is present in each region in an amount of from 0.05% to 3.0% by weight of the region or of the chewing gum composition.

30 12. A composition according to any preceding claim, wherein the flavouring agent is incorporated in each region at a different weight percent.

13. A composition according to any preceding claim, wherein one or more of the regions further
35 comprises a medicament or an active agent, for example, a drug.

14. A composition according to any preceding

claim, wherein the regions are layers and the chewing gum composition is a multi-layer chewing gum.

15. A process in which a chewing gum
5 composition as claimed in any preceding claim,,
is prepared, which process comprises:

(a) providing a first chewing gum composition
having a gum base content of at least 22% by
weight of the first composition;

10 (b) dividing the first composition into
at least a first part and a second part;

(c) adding a diluent to the first part
to reduce the gum base content to an amount in
the range from 14% to 18% by weight to form a
15 diluted first part; and

(d) combining the diluted first part and
the second part non-homogeneously to form a two
part chewing gum composition;

there being a flavouring agent included
20 in each part, the flavouring agent being released
during chewing at a different rate from each
part.

16. A process according to Claim 15, wherein
the diluent is xylitol, mannitol or sorbitol.

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